10977.

Govt. of {18 } Madras.

PUBLIC WORKS.

Dated

Read. Encl.

G.O., 5th Dec. 90, No. 1948 R.

Detailed Completion Reports.

Orders regarding the Submission of — by the Guaranteed Rys of the Madras Presidency

1C/3

Rec'd 8/12 3/12

5TH DECEMBER 1890, No. 1948 R., PUBLIC WORKS.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Railway.

Read again the following papers :—

G.O., dated 9th October 1890, No. 1495 R., Public Works.

Order—dated 9th October 1890, No. 1495 R., Public Works.

The Consulting Engineer for Railways is requested to submit a note embodying such information as may be available with regard to the comparative advantages and cost of a ferry and bridge over the Godávari at Rajahmundry on the East Coast Railway.

(True Extract.)

(Signed) T. GRACEY, Lieut.-Colonel, R.E.,
Offg. Joint Secy. to Govt., P.W.D.,
Railway Branch.

G.O., dated 23rd October 1890, No. 1585 R., Public Works.

From the Consulting Engineer for Railways, dated Madras, 16th October 1890, No. 686.

NOTE by the Consulting Engineer for Railways, dated 16th October 1890, on bridging the Godávari at Rajahmundry.

From the information available in the office of the Chief Engineer for Irrigation it appears that the Godávari at Rajahmundry is about 8,500 feet wide and that the water rises about 17 feet above the dry season level in high floods. The highest known flood over the anicut gave a discharge of about 10,00,000 cubic feet per second, and the average velocity did not exceed 5 miles per hour or 7·3 feet per second in the current. The discharge of 10,00,000 cubic feet per second from the drainage area of 115,000 square miles appears correct, as it nearly corresponds to the highest flood discharge of 820,000 cubic feet per second in the Kistna with a drainage area of 97,000 square miles, and the catchment basins of both rivers appear to be subject to similar rainfall. It will be seen from the plans that the river is narrower at Rajahmundry than at any place within reasonable distance up or down stream. This narrowing is probably caused by the presence of soft sand-stone rock cropping out in the bed of the river at the Rajahmundry side against which the water washes in high flood and where there is always deep water at all seasons. On the Arungabad side on the contrary the water in flood is slack, the bed of the river sandy, and the dry season channel of the river is constantly varying as will be seen from the plan of the sand banks in the river for two seasons about 10 years apart With the exception of the right bank where soft sand-stone rock crops out the bed is said to be of coarse sand which is supposed to extend to a great depth, but no borings have been taken.

2. Owing to the position of the anicut about 4 miles below the bridge site, if the river is bridged at Rajahmundry sufficient water-way should I think be given to pass the highest flood without greatly increasing the average velocity.

It would I think be proper to provide for passing the high floods at a mean velocity not exceeding the mean existing velocity of the river in the current. This

velocity, as before stated, is reported not to exceed 7·3 feet per second. The greatest recorded rise of the river above the ordinary dry season level is 17 feet, and it may be safely assumed that in high flood the average scour will increase this depth to at least 23 feet. Assuming therefore that in high flood the average depth of the water will be 23 feet and the average mean velocity 7·3 feet per second the water-way required to discharge the 10,00,000 cubic feet per second will be $\frac{10,00,000}{23 \times 7·3} = 5,956$ lineal feet. I do not suppose that the river can be made to run with anything like equal velocity and equal scour through all the spans of which the bridge will be composed; on the contrary with a mean depth of 23 feet and a mean velocity of 7·3 feet per second it is probable that through some of the spans the water may be 50 feet deep and the velocity 10 to 12 feet per second, whilst other spans may be silting up, the depth being only 8 or 10 feet and the velocity of the current hardly appreciable.

3. The clear spans of bridge over the Godávari should in my opinion not be less than 200 feet and need not be greater than 242 feet—the former gives a distance of 213 feet from centre to centre of pier, the latter of 259 feet. Anything less than 200 feet would I think obstruct the water-way too much, and anything more than 242 would increase the cost of the bridge inordinately.

4. I understand that bricks of good quality can be made cheaply and easily at several places along the canals near the head works and that the stone at hand is very inferior. I therefore assume that the bridge if built will be of brickwork.

5. A design for the bridge similar to that which has been lately sanctioned for the Kistna should be suitable, and altering the rates to suit brickwork masonry the cost for piers for 200 and 242 feet clear spans should be as under:—

			Rs.
200 feet clear spans cost of 1 pier—			
11 tons	iron in well curbs and bund rings at 350 per ton	...	3,850
45,000 cubic feet	well sinking at 25 per 100 cubic feet	...	11,250
4,200 „	concrete cement at 80 per 100 cubic feet	...	3,360
9,500 „	mortar cement at 25 per 100 cubic feet	...	2,375
26,400 „	brickwork in mortar at 50 per 100 cubic feet.		13,200
4,900 „	brickwork in cement at 90 per 100 cubic feet.		4,410
17,400 „	brickwork in mortar in piers at 50 per 100 cubic feet		8,700
2,000 „	Ashlar masonry 1/8 cubic feet	...	3,000
50,000 „	stone pitching at 10 per 100 cubic feet	...	5,000
	Total	...	55,145
Contingencies 10 per cent.		...	5,515
	Total cost 1 pier for 200 feet span	...	60,660
	or say	...	61,000

242 feet clear spans cost of 1 pier—			
16 tons	iron in well curbs and bund iron at 350 per ton	...	5,600
62,000 cubic feet	sinking at 25 per 100 cubic feet ...	...	15,500
6,700 „	cement concrete at 80 per 100 cubic feet	...	5,360
12,900 „	mortar concrete at 25 per 100 cubic feet	...	3,225
35,100 „	brickwork in mortar at 50 per 100 cubic feet.		17,550
7,600 „	brickwork in cement at 100 per 100 cubic feet.		7,600
21,800 „	brickwork in piers at 50 per 100 cubic feet ...		10,900
2,500 „	Ashlar masonry at 1/8 per 100 cubic feet	...	3,750
50,000 „	stone pitching at 10 per 100 cubic feet	...	5,000
	Total	...	74,485
Add 10 per cent. for contingencies		...	7,445
	Total cost 1 pier 250 feet spans	...	81,930
	or say	...	82,000

6. The cost of the girders I estimate as below:—

	Rs.
200 feet clear spans erected—	
210 tons at 300 per ton	63,000
242 feet clear spans erected—	
320 tons at 300 per ton	96,000

7. For 5,950 lineal feet 30 spans of 200 feet or 25 spans of 242 feet would be required giving 6,000 and 6,050 lineal feet of water-way and 6,390 and 6,475 lineal feet of bridging respectively.

Assuming that the cost of an abutment is equal to that of $1\frac{1}{2}$ piers, the cost of bridging the Godávari with 200 and 242 feet spans would work out as follows:—

	Rs.
Estimated cost of a bridge of 30 spans of 200 feet clear—	
29 piers at 61,000 each	17,69,000
2 abutments at 91,500 each	1,83,000
30 spans 200 feet girders at 63,000 each	18,90,000
Total ...	38,42,000
Add—	
Earthwork approaches on both banks	1,00,000
Training works on right bank	8,00,000
Plant, &c.	3,50,000
Establishment	2,08,000
Grand Total ...	53,00,000

	Rs.
Estimated cost of a bridge of 25 spans of 242 feet clear—	
24 piers at 82,000 each	19,68,000
2 abutments 1,23,000 each	2,46,000
25 spans 200 feet girders at 96,000 each	24,00,000
Total ..	46,14,000
Add—	
Earthwork approaches on both banks	1,00,000
Training works on right bank	8,00,000
Plant, &c.	3,50,000
Establishment	2,36,000
Grand Total ...	61,00,000

From which it appears that a bridge of 30 spans of 200 feet giving 6,000 lineal feet of water-way might be expected to cost Rs. 53,00,000, and a similar bridge of 25 spans of 242 feet giving 6,050 lineal feet of water-way Rs. 61,00,000. I am of opinion that the 200 feet spans will not obstruct the water-way injuriously, and I therefore think the 200 spans should be adopted.

8. The ferry across the Godávari at Rajahmundry is estimated to cost Rs. 11,00,000, and it will be seen from the plan of the river sand-banks that its maintenance will be costly and that it will be difficult to keep up owing to the constant shifting of the sand-banks on the right bank of the river. It will in fact be constantly necessary to shift the river bank sidings between the middle of June and the middle of December (as the Godávari river is affected by both monsoons and is constantly rising and falling between those periods) to admit of wagons being run on board the ferry boats. It appears doubtful indeed if the ferry could be kept up efficiently during these six months if any abnormal pressure of traffic took place.

9. I have no reliable data upon which I can base an estimate of the cost of maintaining the ferry, but if laying down and taking up sidings and building temporary bridges to reach the channels of the river, losses of permanent-way in sudden floods, maintenance of ferry boats and staff and fare to work them, stations and staff to work them on both banks of the river, quarters for the ferry and station staff and delays in crossing vehicles and wagons especially in times of heavy traffic be taken in account, the annual cost will I feel certain not amount to less than Rs. 1,50,000

per year, which capitalized at 4 per cent. would represent Rs. 37,50,000. If to this sum of Rs. 37,50,000 be added the original cost of the ferry Rs. 11,00,000, the total capitalized cost of the ferry would be Rs. 48,50,000 against Rs. 53,00,000 for a bridge.

10. If the figures I have given above are even approximately accurate, the case in favor of building the bridge is overwhelming, and at all events a case has been made out which I think shows that the cost of building a bridge should be fully investigated and compared with the capitalized cost of maintaining and equipping a ferry before the latter is decided upon. With the help of an Assistant Engineer to make surveys and take borings at Rajahmundry Mr. Spring should be able to make out an estimate for bridging the Godávari in a few months and orders might be issued to Mr. Walker to this effect and the Government of India informed of the action taken.

P.S.—Since writing the above I have ascertained that the annual cost of maintaining the ferry over the Indus at Sukkur was $1\frac{3}{4}$ lakhs.

Submitted to Government.

Order—dated 23rd October 1890, No. 1585 R., Public Works.

Ordered that the Government of India be addressed.

(Here enter No. 1586 R., dated 23rd October 1890.)

(True Extract.)

(Signed) T. GRACEY, Lieut.-Colonel, R.E.,
Offg. Joint Secy. to Govt., P.W.D.,
Railway Branch.

Letter from the Officiating Joint Secretary to the Government of Madras, Public Works Department, Railway Branch, to the Secretary to the Government of India, Public Works Department, dated 23rd October 1890, No. 1586 R.

I am directed to forward copy of a note by the Officiating Consulting Engineer, Madras, on the comparative cost of a bridge and ferry over the Godávari river at Rajahmundry, from which it appears that a bridge of 30 spans of 200 feet is estimated to cost Rs. 53 lakhs or Rs 49,50,000 in cash, omitting Rs. 3,50,000 the estimated value of the tools and plant which will be available for the Kistna bridge works, and that the estimated capitalized cost of maintaining the ferry is Rs. 48,50,000.

2. His Excellency in Council is of opinion that if these figures are even approximately accurate a complete case has been made out for the immediate construction of the bridge, but as the figures are admittedly put forward on incomplete data he considers that sufficient has been shown to call for a complete investigation into the relative cost of building a bridge and establishing and maintaining a ferry over the Godávari at Rajahmundry.

3. His Excellency is of opinion that the investigations connected with the projects should be placed in the hands of Mr. Spring, the Executive Engineer, who has just submitted satisfactory proposals for bridging the Kistna at Bezváda. Mr. Spring could prepare his proposals under the general supervision of Mr. Walker, the Engineer-in-Chief of the East Coast Railway, and would only need the assistance of an experienced Assistant Engineer with one or two subordinates to take borings and make out the requisite plans and estimates. A complete project could probably he got out in six months at a cost not exceeding Rs. 10,000 to Rs. 12,000.

4. His Excellency in Council does not consider it necessary to enter at length into a detailed description of the advantages that a bridge over the Godávari at Rajahmundry would have over a ferry, those advantages being sufficiently obvious. He

therefore trusts that the Government of India will sanction the proposal now made to fully investigate the question and will grant the small sum of money required to meet the expenditure that must be incurred.

Read also the following paper :—

From the Officiating Under-Secretary to the Government of India, Public Works Department (Railway Construction), to the Joint Secretary to the Government of Madras, Public Works Department, Railway Branch, dated Calcutta, 17th November 1890, No. 1012 R.C.

I am directed to acknowledge the receipt of your letter No. 1586 R., dated 23rd October 1890, forwarding a note by the Officiating Consulting Engineer for Railways, Madras, on the comparative cost of a bridge and of a ferry, respectively, over the Godávari river at Rajahmundry, East Coast Railway, and proposing that the question should be fully investigated.

2. In reply, I am to say that the Government of India has no objection to the proposed investigation by such of the East Coast Railway staff as the Government of Madras may consider best, and that the cost of these investigations should be charged against the construction grant for the East Coast line and debited against the head "Preliminary expenses."

ORDER—dated 5th December 1890, No. 1948 R., Public Works.

Communicated, with reference to endorsement No. 686, dated 16th October 1890, to the Consulting Engineer for Railways, who is directed to call upon Mr. Spring to report what staff he will require to fully investigate the question of bridging the Godávari at Rajahmundry and to furnish an estimate of the cost thereof, as also an estimate of the cost of carrying out the investigation.

2. The Consulting Engineer will forward a copy of these Proceedings to the Engineer-in-Chief, East Coast Railway, for information.

(True Extract.)

(Signed) T. GRACEY, Lieut.-Colonel, R.E.,
Offg. Joint Secy. to Govt., P.W.D.,
Railway Branch.

To the Consulting Engineer for Railways.
" Examiner, East Coast Railway Accounts.

Exd. J Moses.
Spare Copies

RAILWAY.

Govt. of {1890} Madras.

PUBLIC WORKS.

Dated December, 5th.

Recd. *Encl.*

G.O., 5th Dec. 1890, No. 1948 R.

DECEMBER.

Bridge or a Ferry over the Godavari River at Rajahmundry

Investigation of the proposal to construct a —, sanctioned by the Government of India with remarks.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Railway.

Read the following papers :—

From the Officiating Joint Secretary to the Government of Madras, Public Works Department (Railway Branch), to the Secretary to the Government of India, Public Works Department, dated 30th October 1890, No. 4437 C.

I am directed to suggest that that it would probably facilitate work if powers of an Engineer-in-Chief were given to Mr. F. J. E. Spring, Executive Engineer of the Kistna bridge, and if he were to work direct under the Consulting Engineer at Madras.

2. There is no railway communication between Mr. Spring's head-quarters at Bezváda and Waltair, the head-quarters of Mr. Walker, the Chief Engineer of the East Coast Railway, and cases requiring reference to Government under present arrangements cannot be answered in much less than a month, whereas if Mr. Spring were working under the Consulting Engineer orders could be obtained in 4 days.

3. It is also considered that periodical inspections of the bridge works could be more conveniently carried out by the Consulting Engineer, Madras, than by the Chief Engineer of the East Coast Railway, as the latter must undertake a journey of 10 days' duration before reaching the bridge, whereas the former can reach Bezváda in less than 36 hours.

4. I am therefore to request that the Government of India will grant the powers of an Engineer-in-Chief to Mr. Spring and that approval may be given to the proposal of the Government of Madras to place him under the Consulting Engineer, Madras, who will be directed to inspect the works not less than once each quarter.

From the Under-Secretary to the Government of India, Public Works Department (General), to the Joint Secretary to the Government of Madras, Public Works Department, Railway Branch, dated Calcutta, 18th November 1890, No. 3188 G.

With reference to your letter No. 4437 C., dated the 30th October 1890, I am directed to state that, for the reasons explained, the Government of India approves of the proposal of the Madras Government to place Mr. F. J. E. Spring, Executive Engineer, Kistna Bridge works, East Coast Railway, directly under the Consulting Engineer at Madras, with powers of an Engineer-in-Chief. I am to add that, from the date on which this arrangement comes into effect, Mr. Spring will receive a local allowance of Rs. 100 per mensem.

ORDER—dated 5th December 1890, No. 1951 R., Public Works.

Forwarded to the Consulting Engineer for Railways, for information and communication to the Engineer-in-Chief, East Coast Railway, as also to Mr. Spring, whose charge will be from the junction with the Southern Mahratta Railway to the north distant signal of Bezváda station.

2. Mr. Assistant Engineer Eaton, who was ordered to the East Coast Railway for the Kistna Bridge works by the Government of India, but was posted to the main line works by Mr. Walker, should now be ordered to report himself to Mr. Spring, for employment on the Kistna bridge.

(True Extract.)

Major, R E.,
Under-Secy. to Govt., P.W.D.,
Railway Branch.

To the Consulting Engineer for Railways.
" Examiner, East Coast Railway Accounts.

Exd. T. K. Narayana Aiyangar.
Spare Copies

RAILWAY.

Govt. of {1890} Madras.

PUBLIC WORKS.

Dated December, 5th.

Recd. *Encl.*

G.O., 5th Dec. 1890, No. 1951 R.

DECEMBER.

Mr. F. J. E. Spring, Executive Engineer, Kistna Bridge Works

Letter from the Government of India approving the proposal to place — directly under the Consulting Engineer for Railways at Madras, with powers of an Engineer-in-Chief, and allowing him a local allowance of Rs. 100 per mensem, forwarded to the Consulting Engineer for Railways with remarks.

No. 4437 C of 3 Dec 1890

FORM No. 10.

MADRAS, _____ 189 .

To

The

Govt of Madras

No. Reply No. of 18

SIR,

Reminder.

Subject.

I am directed to suggest that it would materially facilitate work if ~~he~~ powers of the Engineer in Chief were given to Mr. F. J. E. Spring Exec. Engineer of the Kistna Bridge and he were if he were to work directly under the Consulting Engineer at Madras.

2. There is no Railway Communication between Mr. Spring's head quarters at Rajmundry and Coultair when the head quarters of Mr. Walker the Chief Engineer of the East Coast Railway and the Cases requiring reference to Engineer present arrangements Cannot be answered in much less than a month whereas if Mr. Spring were working under the Consulting Engineer orders

Contribute Mained in 4 days.

3. It is also the Consulted that benedicial instructions y the bridge which Could be more Economically Carried out y the Consulting Engineer in Madras by the ~~Superintending~~ Chief Engineer y the East Coast Railway as the latter Should undertake a journey y 10 days duration from Madras to the Godavery Bridge whereas the former Can reach Bezwada in less than 36 hours -

~~4. If the Govt~~

4. I am therefore to request that the Govt y India will Grant the powers y an Engineer in Chief to Mr. Spring and that allowance may be given to the Superintending Engineer y the East y Madras ~~Madras~~ Railway while in Madras under the Consulting Engineer Madras who will be directed to instruct the work not less than once each Quarter

No. 4437 C dy 30 Oct. 1890

Recd 31/10/1890 29/10/90

31/10

No. 3186 G.

GOVERNMENT OF INDIA.

PUBLIC WORKS DEPARTMENT.

GENERAL.

All communications should be addressed to the Secretary.

Paper

25/11/90

Sir Steuart 31/10/90

To

The Joint Secretary to the Government of Madras,
Public Works Department Railway Branch

Calcutta the 18th November 1890

Sir,

With reference to your letter No. 4437C. dated the 30th October 1890, I am directed to state that, for the reasons explained, the Government of India approves of the proposal of the Madras Government to place Mr. H. G. Spring, Executive Engineer Kistna Bridge Works, East Coast Railway, directly under the Consulting Engineer at Madras with powers of an Engineer in Chief.

I am to add that from the date on which this arrangement comes into effect Mr. Spring will receive a local allowance of Rs. 100/- per mensem.

I have the honour to be,
Sir,
Your most obedient Servant

G H D Walker

Under Secy: to the Govt. of India

Documents Accompanying 6cl

P. W. Department.

Read the following:—

Letter No. 3188 G dy 18th Nov. from Govt of Madras.

FOR ORDERS.

I think Mr. Springs charge should be the Bridge and railway station at Bayworth. The station should I think be included to give employment to Mr. Springs men when they cannot work on the Bridge. Mr. Springs charge would be from the Junction with the Southern Mahratta Railway to North distant signal of Bayworth station.

2. Mr. Assit Engineer Estimates who was ordered to the East Coast railway for the Pattani bridge works by the End of October but was posted to the main line works by Mr. Walker should now be ordered to join the Pattani bridge as soon as the Pattani bridge will not be under Mr. Walker.

approved
3/12/90

20/11/90

14 Nov 26.XI.90.
R 5/12.

I sent manuscript copies of this G.O. to E R + C E R R yesterday. Please say if I may get these papers printed including our letter to India – I shall instruct the Despatches Office not to send spare copies of the printed order to E R or C E R R.

It does not signify 6/12

When I can
Letter may
go 6/12

Rd 4 Dec 90
The Hon'ble Mr. J. H. Garstin C.S.I. &c.
Note for orders

To The Hon'ble W. J. H. Forster C.S.I.

Note for orders

When I was at Bezwada Mr Spring spoke to me about being given the powers of an Engineer in charge with charge independent of Mr Walker and directly under the ~~Govt Madras~~ Consulting Engineer at Madras - He has since written to me on the subject and I have ascertained from the Director General of Railways that he would have no objection

2. I have personal knowledge of both Mr Spring and Mr Walker. The former is a very good man with good practical knowledge of the special work he is employed upon but is a little sanguine with regard to his undertakings. The latter has not much special knowledge regarding the construction of large bridges with wide foundations and is a little difficult to get on with If Mr Walker and Mr Spring are left to work together I therefore fear that there will be friction

between them -

3. With regard to Carrying out the work the plans & Estimates for the Widen have now been Sanctioned and the only Offences that Mr. Spring and make to Mr. Walker are those which Mr. Walker will have to forward to the End of Meadows for orders. To obtain orders in any Subject a letter will have to go from Beyworth to Stratton and three to Meadows and the answer will have to return by the same route a month or 6 weeks will thus be Consumed whilst orders Could be Obtained direct from between Beyworth and Meadows in 4 days -

4. With regard to periodical inspection of the Widen works I think this Could be done much more Easily by the Granting by-pass from Meadows there by Mr. Walker from Walton as the former Can reach Beyworth in 36 hours whereas the latter is 10 days Journey from that place and Could seldom

I pass 20 days to visit the Widen works -

5. The Cost of Orders have stated that Mr. Spring is to be a Sept. of works a ~~small~~ work which is only Given to a Specially Selected Officer placed in charge of a Special work -

6. I recommend that for that Mr. Spring be given the powers of an Inspector in Chief and be placed under the Consulting Engineer for Railways at Meadows who should visit and inspect the Widen works at least once Each Quarter. If any Portrait is appointed by the Secretary the Cost of Orders will have to be Obtained -

J Lee Inspection
24 S
24/10/20

GJ
27/10

Sir

Please say if our letter to India should be written in full for E R + C. E C R. or shall the two + duti only be quoted in the Prop.

Govt Examiner & Auditor Genl

Genl 5/12

E 5/12

1957 P

Mr. 23.+ Rey

H. 27.+.9 Rey.

No. 1951 R

PUBLIC WORKS DEPARTMENT,

RAILWAY BRANCH.

PROCEEDINGS OF THE MADRAS GOVERNMENT.

UNDER date the 5th Decr 90.

READ the following

Letter to the Govt. of India P. W. Deptt. } M. G. No. 1437 C dy 30th Octr: 1890.

Letter from do ——— 3188 R dy 18th Nov——

4 P

Forwarded to the Consulting Engineer for Railways for information and communication to the Engineer-in-Chief East Coast Ry: as also to Mr Spring whose charge will be from the Junction with the Southern Mahratta Railway to the North distant signal of Bezwada station.

2. Mr East Engineer Eaton who was ordered to the East Coast Railway for the Kistna bridge works by

by the Govt. of India but was posted to the main line works by Mr. Walker & should now be ordered to report himself to Mr Spring for employment on the Kistna bridge.

Yr
Dy: R

R

No 1951 Dy 5th Dec/70.

To E.R's copy taken 5/12/70
The Consg Supt for Rys
& Exr E. C. Ry: Accts.
dcpts 5/12/70

SC 18/12